GEOTECHNICAL INVESTIGATION
on
Santa Clara Square
Halfrord Avenue
Santa Clara, California
for
Ms. Emily Chen

By

TERRASEARCH, inc.

Project No. 9993.G
October 6, 2003

Environmental • Geotechnical • Special Inspections • Materials Testing
TERRASEARCH INC.
SERVING NORTHERN CALIFORNIA SINCE 1969

GEOTECHNICAL
GEOLOGICAL
ENVIRONMENTAL
SPECIAL INSPECTIONS
MATERIALS TESTING

SAN JOSE:
6840 Via Del Oro
Suite 110
San Jose, CA 95119
(408) 362-4920
Fax: (408) 362-4926

LIVERMORE:
257 Wright Brothers Ave.
Livermore, CA 94550
(925) 243-6662
Fax: (925) 243-6663

SACRAMENTO:
4200 N. Freeway Blvd.
Suite 2
Sacramento, CA 95834
(916) 564-7809
Fax: (916) 564-7672

Project No. 9993.G
October 6, 2003

Ms. Emily Chen
21009 Seven Springs Parkway
Cupertino, CA 95014

SUBJECT: Proposed Development
Santa Clara Square
Halford Avenue
Santa Clara, California
GEOTECHNICAL INVESTIGATION

Dear Ms. Emily Chen:

In accordance with your authorization, *TERRASEARCH, Inc.*, has investigated the geotechnical conditions at the subject site located off Halford Avenue in Santa Clara, California.

The accompanying report presents our conclusions and recommendations based on our investigation. Our findings indicate that the site is suitable, from a geotechnical standpoint, for the proposed development provided the recommendations of this report are carefully followed and are incorporated into the project plans and specifications.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

Very truly yours,
TERRASEARCH, Inc.,

George Maidissy, P.E.

REGISTERED PROFESSIONAL ENGINEER
JOHAN A. JACOBSEN
NO. C59867
Exp. 12/31/03
CIVIL
STATE OF CALIFORNIA

Johan A. Jacobsen, P.E.
Project Engineer

TABLE OF CONTENTS

Page No.

GEOTECHNICAL INVESTIGATION

Purpose and Scope

The purpose of our investigation for the proposed residential/retail development located between Halford Avenue and Lawrence Expressway south of El Camino Real in Santa Clara, California, was to determine the surface and subsurface soil conditions at the subject site. Based on the results of the investigation, criteria were established for grading the site, and to establish geotechnical recommendations for the proposed development. The enclosed geotechnical recommendations are based on our evaluation and investigation and on a tentative site plan provided by the client.

Our investigation included the following:

a) Review of pertinent published geotechnical literature on the site;
b) Surface reconnaissance by the Soil Engineer;
c) Drilling and sampling of the subsurface soils at 8 locations;
d) Laboratory testing of selected soil samples;
e) Engineering analysis of the data and formulation of conclusions and recommendations;
f) Preparation of this written report.

Details of our field and laboratory field investigation are presented in Appendices A and B.

Proposed Development

The tentative plans for the site development visualize a combination of retail and residential use with possible underground parking. The building are expected to be four stories in height, situated on one level of underground parking. The depth of the excavation required to accomodatee the basement is expected to be approximately 12 feet below current grade. The project will also include installation of underground public utilities, interior streets, and associated improvements. Based on the tentative site plan provided, and due to the relatively flat nature of the site, it is anticipated that grading operations will consist of minor grading to achieve final design grades, and excavations for the underground parking structure. Loading details are not known at this time, however for the purpose of our report loading conditions are anticipated to approximately be: Column dead plus live loads 850 kips for interior columns to 450 kips for exterior columns and a line load of 1.25 kips per foot for exterior wall loads.

Site Location and Description

The rectangular shaped, relatively flat site is approximately 12 acres and is currently used for parking. A portion of the site in the southwestern corner of El Camino Real and Lawrence Expressway is occupied by a Taco Bell Restaurant which is to be removed. An existing gas station is located at the southwestern corner of El Camino Real and Halford Avenue, which is to remain. An existing Kmart building which is located to the immediate south of the subject property is to remain.

The site is bounded by to the north by El Camino Real, to the east by the Lawrence Expressway, to the west by Halford Avenue and to the south by an existing Kmart retail store. The location of the site is shown on the Vicinity Map, Figure 1 of Appendix A. This description of the site is based on a reconnaissance by the Soil Engineer, and a tentative site plan. The site plan is the basis for our "Site Plan," Figure 2 of Appendix A.

Sub-surface Conditions

The sub-surface soil conditions as encountered in our eight test borings indicate that the near surface sub-grade soils consist of a brown to dark brown silty clay to an approximate depth of 15 to 25 feet below existing grade. The silty clay overlies interbedded dense to very dense layers of clayey and silty sands with varying amounts of gravel. Relatively loose sandy layers were erratically interspersed and were estimated to be generally, approximately 6 inches in thickness. It was not possible to effectively sample these thin layers, but based on our observations during our exploratory borings, it was estimated that the total thickness of the sand layers in the upper 50 feet of soil sub-grade was approximately 60 inches.

Plasticity tests of the subsurface soils at the foundation level for the on grade structures indicate a moderate to high propensity for this material to expand when exposed to increases in moisture content. Care must be taken to provide good surface drainage so that soil expansivity does not affect the building foundations, pavement or concrete flatwork.

Groundwater was encountered in each boring at depths ranging from 21 to 24 feet below the ground surface.

Geologic Setting

The subject site is within the Coast Ranges geomorphic province, a belt of sedimentary, volcanic, and metamorphic rocks, which extend from southern California to Oregon. The structural geology of the Coast Ranges is complex and dominated by transpressive stress (combined transform and compressional) concentrated along faults within the San Andreas Fault system. On the eastern portion of the San Francisco Bay, bedrock geology consists of sedimentary and metamorphic rocks ranging from Cretaceous through Quaternary periods (up to 144 million years to present).

The subject site is located in the western portion of Santa Clara, California, immediately south of El Camino Real and between Halford Avenue and Lawrence Expressway. According to Helley (1979), the site is underlain by Holocene medium-grained alluvium (Qham), which consists of unconsolidated, moderately sorted, moderately permeable fine sand, silt and clayey silt with occasional thin beds of coarse sand. The medium-grained alluvium was deposited from braided streams on alluvial fans near the mid-fan region and has a maximum thickness of approximately 12 feet. The medium-grained alluvium is underlain by thick sequences of older alluvium (clay, silt, sand and gravel). The older alluvium is greater than 5 kilometers (km) thick and is underlain by the Franciscan Complex and Tertiary sedimentary rocks.

The Monte Vista-Shannon Fault is the closest active-fault, situated approximately 7.7 km southwest of the subject site. The Monte Vista-Shannon Fault is listed as an active reverse fault by the Alquist-Priolo (AP) Earthquake Fault Zones Act (Division of Mines and Geology [DMG], 1994).

The site is not located within an AP zone, but is located within a Seismic Hazard Zone (DMG, 1997). Other faults located within a 100 km radius of the site are shown on Table 1, based on the EQFAULT computer program by Thomas Blake.

Table 1
Earthquake Fault Zone Data

Fault Name	Fault Type	Distance (km)	Fault Magnitude (M_w)
Monte Vista-Shannon	Reverse	7.7	6.8
San Andreas (1906)	Strike-Slip	14	7.9
San Andreas (Peninsula)	Strike-Slip	14	7.1
Hayward	Strike-Slip	19	7.1
San Andreas (Santa Cruz)	Strike-Slip	20	7.0
Calaveras (Northern)	Strike-Slip	20	6.8
Calaveras (Southern)	Strike-Slip	20	6.2
Sargent	Reverse	24	6.8
Zayante-Vergeles	Thrust	30	6.8
San Gregorio	Strike-Slip	35	7.3
Greenville	Strike-Slip	44	6.9
Monterey Bay – Tularcitos	Strike-Slip	49	7.1
Great Valley 5	Blind Thrust	50	6.7
Great Valley 7	Blind Thrust	51	6.7
San Andreas (Pajaro)	Strike-Slip	52	6.8
Concord-Green Valley	Strike-Slip	60	6.9
Palo Cororado – Sur	Strike-Slip	63	7.0
Ortigalita	Reverse	64	6.9
Great Valley 8	Blind Thrust	66	6.6
San Andreas (Creeping)	Strike-Slip	73	6.5
Quien Sabe	Thrust	73	6.4
San Andreas (North Coast)	Strike-Slip	74	7.6
Rinconada	Strike-Slip	78	7.3
Great Valley 5	Blind Thrust	78	6.5
Rogers Creek	Strike-Slip	87	7.0
Great Valley 9	Blind Thrust	88	6.6
West Napa	Strike-Slip	93	6.5
Point Reyes	Strike-Slip	100	6.8

Seismic Considerations

Damage to structures related to fault movement may be divided into two categories:

a) Primary deformation such as displacement of a structure located directly on a fault and violent ground shaking; and

b) Secondary failure such as lurch cracking, landsliding, liquefaction, and differential compaction.

Surface faulting or ground rupture tends to occur along lines of previous faulting. Since previously identified fault lines are not within the site or project toward the site, the possibility of surface fault rupture is negligible within the subject property.

Ground shaking is a complex concept related to velocity, amplitude, and duration of earthquake vibrations. Damage from ground shaking is caused by the transmission of earthquake vibrations from the ground to the structure. The most destructive effects of an earthquake are usually seen where the ground is unstable and structures are poorly designed and constructed. Maximum accelerations in rock and soil are based on the attenuation relationships formulated by Sadigh and Chang (1997) and Abrahamson and Silva (1997). FRISKSP computer program by Blake (2001) was used to calculate site-specific probabilistic peak ground accelerations (PGA) for the site. FRISKSP is a computer program for the probabilistic estimation of seismic hazard using three-dimensional faults as earthquake sources.

Using a 10% probability of exceedance within 50 years with maximum-horizontal ground acceleration was calculated for the site at 0.60g. This calculation considered all active earthquake fault zones within a 100-kilometer radius of the site and a return period of 475 years.

Since the property is not situated on a hillside, the site is not susceptible to landsliding during a strong seismic event. However, the site is susceptible to liquefaction, differential compaction and/or ground lurching due to the nature of the subsurface materials. Liquefaction describes the phenomenon wherein granular soils lose their supportive strength and become prone to rapid settlement and loss of bearing capacity. Liquefaction occurs during earthquake conditions in saturated, relatively loose, sandy soils located near the ground surface.

The data used for evaluating liquefaction potential on this site consisted of: the penetration resistance encountered during soil sampling (N-counts), the soil type and percentage of fines, the relative density of the materials, and the groundwater level.

Based on the data obtained the liquefaction potential on this site is considered moderate to high. Silty sands may experience potential settlements of up to 1½ % of the thickness of the potentially liquefiable material under severe seismic conditions for those portions of the sub-grade below the water table and within 50 feet of the ground surface. Seismically induced settlements of up to 1 inch should be anticipated under strong seismic loading. Differential settlements of half that amount can be anticipated. Long term and seasonal changes in ground water elevations are not expected to significantly increase the liquefaction potential of this site.

The site will experience strong ground shaking if a large earthquake occurs along the Hayward and/or San Andreas Faults. Since the subject site is located near the San Francisco Bay, the secondary hazards of tsunamis or seiches are probable, but unlikely.

UBC Earthquake Design Criteria

The 1997 Uniform Building Code (UBC) Chapter 16, Division IV Earthquake Design requires that structures be designed using certain earthquake design criteria. The criteria are based in part on the seismic zone, soil profile and the proximity of the site to active seismic sources (faults). During an earthquake event, structures located very close to active faults can be subjected to near source energy motions that may be damaging to structures, if the effects of these energy motions are not considered in the structural design. The UBC indicates that the types of seismic sources (active faults) that generate near source (N_a and N_v) greater than 1.0 are classified as Type A or Type B. The nearest Type A or Type B active fault to the site is the Monte Vista-Shannon Fault, which is located approximately 7.7 km southwest of the subject site and is categorized as a Type B fault.

Based on the geotechnical data in the referenced report and the selection of criteria of the 1997 UBC, Chapter 16, Division IV, Earthquake Design, a summary of the earthquake design criteria for use in the design of the proposed structures is as follows:

Seismic Zone	=	4
Soil Profile Type	=	S_D
Near Source Factor N_a	=	1.00
Near Source Factor N_v	=	1.09

DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

General

1. From a geotechnical perspective, the site is suitable for the construction of the proposed development provided the recommendations presented in this report are incorporated into the project plans and specifications.

2. The proposed residential structures may be supported on a structural mat or post tensioned slab foundation system. Specific recommendations for each foundation system are provided in the "foundation" section herein. It is anticipated that the condominiums with underground parking will be supported on spread footings. It is noted that after excavation of the basement, 4 to 15 feet of the very stiff clay will remain between the underground parking and the top of the dense sand layer and generally average 8 feet thick.

3. The most significant geotechnical factors affecting the site are the seismic factors discussed above, and the potential for liquefaction induced settlements.

Demolition

4. Prior to any grading in the vicinity of the existing structures located in the northeastern portion of the site, demolition should be completed. Demolition should include the complete removal of all surface and subsurface structures including tree root systems, concrete, septic tanks and leach fields (if present), gas and oil tanks (if present), foundations, asphalt, debris and trash, and any other items not designated to remain. Underground utilities and buried irrigation pipelines that are located within the upper three (3) feet of finished pad grade must also be removed. Any utilities or pipes located greater than three feel below finished pad grade may remain in place. Any water wells encountered at the site should be abandoned in accordance with the applicable county standards. All demolition debris must be removed off site. **It is vital that TERRASEARCH, Inc.** intermittently observe the demolition and grubbing operations to ensure that no subsurface structures are covered and that the root systems from grubbing operations are completely removed.

5. Excavations made by the removal of any structure should be left open by the demolition contractor for backfill in accordance with the requirements for engineered fill. The removal of any underground structures should be done under the observation of the Soil Engineer to assure the adequacy of the removal and that subsoils are left in proper condition for placement of engineered fills. Any soil exposed by the demolition operations, which are deemed soft or unsuitable by the Soil Engineer, shall be excavated as uncompacted fill soil and be removed as required by the Soil Engineer during grading. The demolition operation should be approved by the Soil Engineer prior to commencing grading operations. Any resulting excavations should be properly backfilled with engineered fill under the observation of the Soil Engineer. Should the location of any localized excavation be found to underlie any structure, backfill should be compacted to a minimum relative compaction of 95% or the excavation widened to extend at least 5 feet beyond the footprint of the structure and backfilled to the specifications for engineered frill as recommended in the "grading" section herein. If any excavations are loosely backfilled without our knowledge, and these excavations are not properly backfilled during grading, future settlement of these loosely filled excavations will occur and will cause damage to structures or other improvements.

Grading

6. The grading is expected to consist primarily of minor grading operations to achieve design grades and to construct the building pads, and excavations for those structures with below grade parking. Grading requirements presented herein are an integral part of the grading specifications presented in Appendix C of this report and should be considered as such.

7. Grading activities during the rainy season may be hampered by excessive moisture. Grading activities may be performed during the rainy season, however, achieving proper compaction may be difficult due to excessive moisture; and delays may occur. Grading performed during the dry months will minimize the occurrence of the above problems.

8. Following removal of the existing pavement, any loose and/or soft soil, and nonengineered fill, the top 8 inches of exposed native ground should be scarified and compacted to a minimum degree of relative compaction of 90% at 2% to 3% above optimum moisture content as determined by ASTM D1557-91 Laboratory Test Procedure. All soils encountered during our investigation are

suitable for use as engineered fill when placed and compacted at the recommended moisture content and provided it does not contain any debris.

9. It is recommended that the existing pavement section in proposed building footprint areas be removed and the soil surface exposed during demolition to allow examination of the subgrade for the presence of loose or soft fills. In areas outside the building footprint, the aggregate base material may be left in place, if desired, provided it does not impact landscape growth or construction of irrigation or utility lines.

10. Following removal of the existing pavement, any loose and/or soft soil, the top 8 inches of exposed ground for fill areas should be scarified and compacted to a minimum degree of relative compaction of 90% at a moisture content above optimum as determined by ASTM D1557-91 Laboratory Test Procedure. After recompacting the subgrade, the site may be brought to the desired finished grades by placing engineered fill in lifts not to exceed 8 inches in uncompacted thickness and compacted to the relative compaction requirements in accordance with the aforementioned test procedure. All soils encountered during our investigation would be suitable for use as engineered fill when placed and compacted at the recommended moisture content.

11. Should select import material be required to establish the proper grading for the proposed development, the import material should be approved by the Soil Engineer before it is brought to the site and should meet the following requirements:

a. Have an R-Value of not less than 25;
b. Have a Plasticity Index not higher than 12;
c. Not more than 15% passing the No. 200 sieve;
d. No rocks larger than 6 inches in maximum size.

12. Import material meeting the requirements stated above should be compacted to the requirements stated above. In addition, import should be placed in such a way as to provide uniformity beneath all structural areas. No ponding of storm water is to be permitted on cut or fill pads during prolonged periods of inclement weather.

13. Should any building encompass a cut/fill pad, the cut area should be over-excavated to provide a minimum of two feet of uniform fill below the foundation. Over-excavation is necessary to minimize the effects of differential movement.

Excavation Requirements

14. It is anticipated that excavation for the underground garage will result in cuts of about 10 to 12 feet in vertical height. It is expected that the excavation will extend 1 to 2 feet away from the outside face of the basement wall to allow proper forming of the wall and construction of a drainage blanket and waterproofing. Based on the nature of the materials that will form the basement excavation, it is recommended that the excavations be sloped at ½:1 (horizontal to vertical). This is based on the excavation being left unsupported for a period of a few weeks during dry weather. If the slopes are left unsupported for more than a few weeks, some minor sloughing may occur but is not considered unsafe for workers due to the open nature of the bulk excavation.

15. If wet or rainy weather is imminent and the excavations are still unsupported, the excavation should be covered with plastic to mitigate against possible sloughing.

16. No materials or equipment should be stored or vehicles parked within 7 feet from the top of excavation.

17. If utility trenches are located very close to the excavation, then provision must be implemented to ensure the stability of the sidewalk area and the excavation itself. Such provisions may consist of:

i) Driving sheet piles or constructing a soldier beam system along the perimeter of the excavation immediately adjacent to areas where utilities exist.

ii) Constructing a bracing system that will support the slope for the duration of constructing the retaining walls.

18. The Soil Engineer must observe and monitor the condition of the cutslope during excavation activities in order to render an opinion pertaining to their stability.

19. The soil engineering parameters provided in this report for design of retaining walls can be applied for the design of any of the alternatives discussed above with the exception of a bracing system. If a bracing system is to be used, then recommendations will be provided later, if needed.

Foundations: Structures On-Grade

20. A structural mat, or post-tensioned slab foundation system is preferred to support the proposed on grade structures. The following foundation recommendations are contingent upon adequate surface drainage being constructed as recommended in this report as designed by the project Civil Engineer, and maintained by the property owners at all times.

21. Structural mats and post tensioned slabs should be designed for moderately expansive soil conditions as described below. Additionally, the mats or post tensioned slabs must be designed to accommodate differential settlements of up to 0.5 inch due to liquefaction induced settlements. Differential settlements are measured from the corner of the slab to the center.

Post-Tensioned Slab Foundation

22. Post-tensioned slabs should be a minimum 10 inches in thickness and designed using the following criteria which is based on the design method of the 1997 Uniform Building Code, Chapter 18, Division III, Sections 1816 and 1817, Design of Post-Tensioned Slabs on Ground:

Liquid Limit	=	50
Plasticity Index	=	30
Allowable Bearing Capacity	=	2,000 p.s.f.
Depth to Constant Moisture	=	5 feet
Percent Passing #200	=	70%
Edge Moisture Variation Distance:		
Edge Lift	=	3.0 feet

Center Lift = 5.0 feet

Differential Swell:

Y_m (Edge Lift) = 0.8 inches

Y_m (Center Lift) = 3.0 inches

Structural Mat

23. Structural mat slabs should be a minimum of 10 inches in thickness and designed using the method presented in the 1997 Uniform building Code, Chapter 18, Division III, Section 1815, Design of Slab-on-Grade Foundations

24. Based on the above, it is recommended that the structural mat foundation be designed using an Effective Plasticity Index value of 30. The maximum allowable bearing pressure at the base of the mat and for localized thickened footings should not exceed 2,000 p.s.f. for dead plus sustained live loads.

Foundations: Structures with Below-Grade Parking

25. It is our understanding that the proposed parking will be a one-story facility that will extend under the entire breadth of the above ground building.

26. If desired, structures with below grade parking may be supported on conventional spread footing foundations.

27. Prudent structural design should consider differential settlements of 0.5 inches in 25 feet for the parking structure retaining walls.

28. The spread footing should extend a minimum depth of 24 inches into undisturbed native soil. The depth of embedment should be measured from the lowest adjacent pad elevation (trenching depth). The recommended design bearing pressure for continuous footings should not exceed 2800 psf due to dead plus live loads, and 3600 psf for all loads which include wind and seismic. These values may be increased to 3100 psf due to dead plus live loads, and 4000 psf for all loads which include wind and seismic for isolated square footings.

29. To accommodate lateral building loads, the passive resistance of the foundation soil can be utilized. The passive pressures can be assumed to act against the front face of the footing for the entire depth of the footing. A passive pressure equivalent to that of a fluid weighing 325 pcf. may be used. An allowable friction coefficient of 0.30 can be assumed at the base of the footing.

Retaining Walls

30. The below grade retaining walls should be designed to resist to resist lateral pressures exerted from a media having an equivalent fluid weight as follows:

Gradient of Back Slope	Equivalent Fluid Weight (pcf)		
	Unrestrained Condition (Active)	**Passive Resistance**	**Coefficient of Friction**
Flat	45	300	0.35

In addition, restrained retaining walls including walls incorporated into the construction of the below grade parking garage, should be designed to resist an additional uniform pressure of 100 psf over the entire height of the wall. Pressures exerted during compaction of backfill and all pressures due to any surcharge loads must be considered in the design of the walls.

31. The above criteria are based on fully drained conditions. If drained conditions are not possible, then the hydrostatic pressure must be included in the design of the wall. A linear distribution of hydrostatic pressure of 63 pcf should be adopted.

32. In order to achieve fully drained conditions, a drain blanket should be placed behind the retaining walls. The blanket should be a minimum of 12 inches thick and should extend the full height of the wall to within 12 inches of the surface. If the excavated area behind the wall exceeds 12 inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or blanket material. The drainage blanket material may consist of either granular crushed rock or drain pipe fully encapsulated in geo-textile filter fabric or Class II

permeable material that meets CalTrans Specification, Section 68, with drainage pipe, and optional fabric. A 4-inch perforated drainpipe (with the perforations turned down) should be installed in the bottom of the drainage blanket and should be underlain by at least 2 inches of filter type material. A 12-inch cap of native soil material should be placed over the drainage blanket. Use of products such as *Miradrain* is not an acceptable alternate to a conventional gravel sub-drain.

33. To reduce moisture intrusions into the garage area, the drainage blanket for any retaining wall that is part of the parking structure should extend to at least 8 inches below the <u>bottom</u> of the poured concrete slab on grade. This may require that the drainage blanket extend behind and below the top of the retaining wall footing. Any water collected from the drainage behind the wall should be dischareged into an adequate sump and pum system and then to a surface drain

34. Piping with adequate gradient shall be provided to discharge water that collects behind the walls to an adequately controlled approved location away from the structure's foundation. It is anticipated that the garage retaining wall sub-drains will discharge to a sump and sump pump system.

General Slab Construction Requirements

35. Poured concrete slabs-on-grade are anticipated for the underground parking structure, mat or post tensioned slab foundations, and exterior flatwork. To reduce cracking of the concrete, the following are recommended.

Structural Mat & Post-Tensioned Slab

36. Slabs may be constructed at pad grade. The perimeter of the slab should be thickened to bear on the prepared building pad and to confine the sand.

37. A 10 mil Visqueen-type membrane should be placed between the prepared subgrade and the slab to provide an effective vapor barrier, and to minimize moisture condensation under the floor covering. The vapor barrier membrane shall be lapped adequately to provide a continuous vapor proof barrier under the entire slab. Care must be taken to assure that the membrane does not

become torn and entangled with the reinforcing. The Soil Engineer must observe the sub-grade preparation prior to placement of the Visqueen.

38. A minimum of two inches of wetted sand should be placed over the vapor barrier to act as a cushion to protect the membrane and to facilitate curing of the concrete.

Concrete Flatwork

39. It is expected that the garage slabs (for underground parking), concrete driveways and other flatwork may experience cracking due to the moderate expansivity of site soils. To reduce the potential cracking of the concrete, the following are recommended. Concrete slabs in the underground parking garage, driveways and other concrete flatwork should be underlain by a minimum of 4 inches of gravel or clean crushed rock material placed between the finished subgrade and the slabs to serve as a cushion between the subsoil and the slab. See the "Guide Specifications For Rock Under Floor Slabs", Appendix C.

40. The slabs should be adequately reinforced as determined by the project structural engineer. The reinforcement shall be placed in the center of the slab unless otherwise designated by the design engineer.

41. All flatwork slabs should be poured structurally independent of the foundations. A 30-pound felt strip, expansive joint material, or other positive separator should be provided around the edge of all floating slabs to prevent bond to the structure's foundation.

Pavement Design

42. After underground facilities have been placed in the areas to receive pavement and removal of excess material has been completed, the upper 6 inches of the subgrade soil should be scarified, moisture conditioned and compacted to a minimum relative compaction of 95% at moisture content above optimum in accordance with the grading recommendations specified in this report.

43. All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM D1557-91 Test Procedure. The construction of the pavement in the pavement areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or City of Santa Clara, Department of Public Works.

44. Since grading is anticipated to consist of cuts and fills, it is difficult to determine what type of soils will comprise the street subgrade in order to perform R-Value testing. However, for design purposes, an R-Value of 10 can be assumed based for the subsurface soils encountered at the site. The recommended design thicknesses presented in Table 1 were calculated in accordance with the methods presented in Topic 608 of the California Department of Transportation Highway Design Manual." During grading operations, representative samples of actual subgrade soil should be collected and tested to determine the actual R-Value's so that a final design may be obtained.

TABLE 2

Recommended Asphalt Concrete Pavement Sections

Design Traffic Index	Asphalt Concrete Type B (inches)	Aggregate Base Class II[1] (inches)
4.5	3.0	9.0
5.0	3.0	10.0
5.5	3.0	12.0
6.0	3.0	13.5
6.5	4.0	15.0

Notes:
(1) Minimum R-Value = 78
(2) R-Value = Resistance Value
(3) All layers in compacted thickness to Cal-Trans Standard Specifications

45. Where planters are planned within or adjacent to a pavement area, provisions should be made to prevent irrigation water from entering the pavement sub-grade and foliage requiring minimal irrigation be considered. Water entering the pavement section at sub-grade level could cause softening of this zone and subsequently pavement failure will occur. It is recommended that landscape islands within pavement be equipped with a sub-drain system that discharges to a location approved by the project Civil Engineer.

Utility Trenches

46. Applicable safety standards require that trenches in excess of 5 feet must be properly shored or that the walls of the trench slope back to provide safety for installation of lines. If trench wall sloping is performed, the inclination should vary with the soil type. The underground contractor should request an opinion from the Soil Engineer as to the type of soil and the resulting inclination.

47. With respect to state-of-the-art construction or local requirements, utility lines are generally bedded with granular materials. These materials can convey surface or subsurface water beneath the structures. It is, therefore, recommended that all utility trenches which possess the potential to transport water be sealed with a compacted impervious cohesive soil material or lean concrete where the trench enters/exits the building perimeter. This impervious seal should extend a minimum of 2 feet away from the building perimeter.

48. Utility trenches extending underneath all traffic areas must be backfilled with native or approved import material and compacted to a minimum relative compaction of 90% at a moisture content above optimum to within 6 inches of the subgrade. The upper 6 inches should be compacted to a minimum of 95% relative compaction in accordance with Laboratory Test Procedure ASTM D1557-91. Backfilling and compaction of these trenches must meet the requirements set forth by the City of Santa Clara, Department of Public Works. Utility trenches within landscape areas may be compacted to a relative compaction of 85%.

General Construction Requirements

49. Liberal lot slopes and drainage must be provided by the project Civil Engineer to remove all storm water from the pads and to prevent storm and/or irrigation water from seeping beneath the structures. Should surface water be allowed to seep under the structures, foundation movement resulting in structural damage will occur. All compacted, finished grades should be sloped at a minimum 2% gradient away from the exterior foundation for a distance of 3 feet. Should the recommended surface drainage be altered by the property owner, then a subdrain

system should be constructed around the perimeter of the structure. Specific recommendations for sub-drain construction will be provided upon request.

50. Roof gutters and downspouts are recommended to carry storm water away from the structures and graded areas and, thus, reduce the possibility of soil saturation adjacent to the foundations.

51. Flower beds or planters are not recommended adjacent to the building foundations because of the possibility of irrigation water affecting the foundations or slabs. Should planters be constructed, foliage requiring little irrigation should be planted. Planters adjacent to the buildings should be equipped with drainage inlets that discharge to a location approved by the project Civil Engineer. It is preferred that irrigation adjacent to the building foundations consist of a drip system. Sprinkler systems may be used; however, it is preferred that sprinkler heads do not water closer than 3 feet from the building foundations. If sprinklers are used within 3 feet, then excessive watering should not be allowed; and good surface drainage in the planter area must be provided. In any case, it is recommended that area surface drains be incorporated into the landscaping to discharge any excessive irrigation or rainwater that may accumulate in the planter area. These surface drains must be constructed in a manner that easy flow of surface water runoff is allowed into the pipe inlets.

Project Review and Construction Monitoring

52. All grading and foundation plans for the development must be reviewed by the Soil Engineer prior to contract bidding or submitted to governmental agencies so that plans are reconciled with soil conditions and sufficient time is allowed for suitable mitigative measures to be incorporated into the final grading specifications.

53. *TERRASEARCH, Inc.*, should be notified at least two working days prior to site clearing, grading, and/or foundation operations on the property. This will give the Soil Engineer ample time to discuss the problems that may be encountered in the field and coordinate the work with the contractor.

54. Field observation and testing during the grading and/or foundation operations must be provided by representatives of *TERRASEARCH, Inc.*, to enable them to form an opinion regarding the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. Any work related to the grading and/or foundation operations performed without the full knowledge and under the direct observation of the Soil Engineer will render the recommendations of this report invalid. The degree of observation and frequency of testing services would depend on the construction methods and schedule, and the item of work. Please refer to "Guidelines For Required Services" for an outline of our involvement during project development.

55. Should another geotechnical consultant be engaged to perform project review and/or construction monitoring, then *TERRASEARCH, Inc.*, must receive a letter of indemnification releasing us of any responsibility on the project.

References

Abrahamson, N.A. and Silva W.J., January/February 1997. *Empirical Response Spectral Attenuation Relations for Shallow Crustal Earthquakes.* Seismological Research Letters, Volume 68, Number 1, Pages 94 - 127.

Blake, Thomas F., 2001. EQFAULT Computer Program, Version 3.0.

Blake, Thomas. F., 2001. FRISKSP Computer Program, Version 4.00.

Continuing Education in Environmental Management & Engineering, University Extension, University of California, Berkeley. *Evaluation and Mitigation of Seismic Hazards Handbook, August 17 – 19, 2000.*

Petersen, M., Toppozada, T., et. al., 1998. *New Geologic Maps Lend Support to Better Building Design in California Earthquake Country,* California Geology, Vol. 51, No. 2, p. 3-9.

Sadigh, K. and Chang, C.-Y., *et. al.*, January/February 1997. *Attenuation Relationships for Shallow Crustal Earthquakes Based on California Strong Motion Data.* Seismological Research Letters, Volume 68, Number 1, Pages 180 – 189.

Uniform Building Code, 1997. Section 16, Tables 16-J, 16-Q through 16-U.

Wagner, D.L., Jennings, C.W., Bedrossian, T.L. and Bortugno, E.J., 1981. Geologic Map of the Sacramento Quadrangle, California. Regional Geologic Map Series – Map 1A, Scale 1:250,000.

GUIDELINES FOR REQUIRED SERVICES

The following list of services are the services required and must be provided by *TERRASEARCH, Inc.*, during the project development. These services are presented in check list format as a convenience to those entrusted with their implementation.

The items listed are included in the body of the report in detail. This list is intended only as an outline of the required services and does not replace specific recommendations and, therefore, must be used with reference to the total report. This does not imply full-time observation. The degree of observation and frequency of testing services would depend on the construction methods and schedule, and the item of work.

The importance of careful adherence to the report recommendations cannot be overemphasized. It should be noted, however, that this report is issued with the understanding that each step of the project development will be performed under the direct observation of *TERRASEARCH, inc.*

The use of this report by others presumes that they have verified all information and assume full responsibility for the total project.

Item Description	Required	Not Required	Not Anticipated
1. Provide foundation design parameters	X		
2. Review grading plans and specifications	X		
3. Review foundation plans and specifications	X		
4. Observe and provide recommendations regarding demolition	X		
5. Observe and provide recommendations regarding site stripping	X		
6. Observe and provide recommendations on moisture conditioning, removal, and/or precompaction of unsuitable existing soils	X		
7. Observe and provide recommendations on the installation of subdrain facilities	X		
8. Observe and provide testing services on fill areas and/or imported fill materials	X		
9. Review as-graded plans and provide additional foundation recommendations, if necessary	X		
10. Observe and provide compaction tests on sanitary sewers, storm drain, water lines and PG&E trenches (if not done by city)	X		
11. Observe foundation excavations and provide supplemental recommendations, if necessary prior to placing concrete	X		
12. Observe and provide moisture conditioning recommendations for foundation areas prior to placing concrete	X		
13. Provide design parameters for retaining walls	X		
14. Provide observations and recommendations for keyway excavations and cutslopes during grading			X
15. Excavate and recompact all geologic trenches and/or test pits		X	
16. Observe installation of subdrains behind retaining walls	X		

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify *TERRASEARCH, Inc.*, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, *TERRASEARCH, Inc.*, will provide supplemental recommendations as dictated by the field conditions.

3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Not withstanding, all the foregoing applicable codes must be adhered to at all times.

APPENDIX A

Field Investigation

Site Plan & Vicinity Map

Logs of Test Borings

Boring Log Legend and Notes

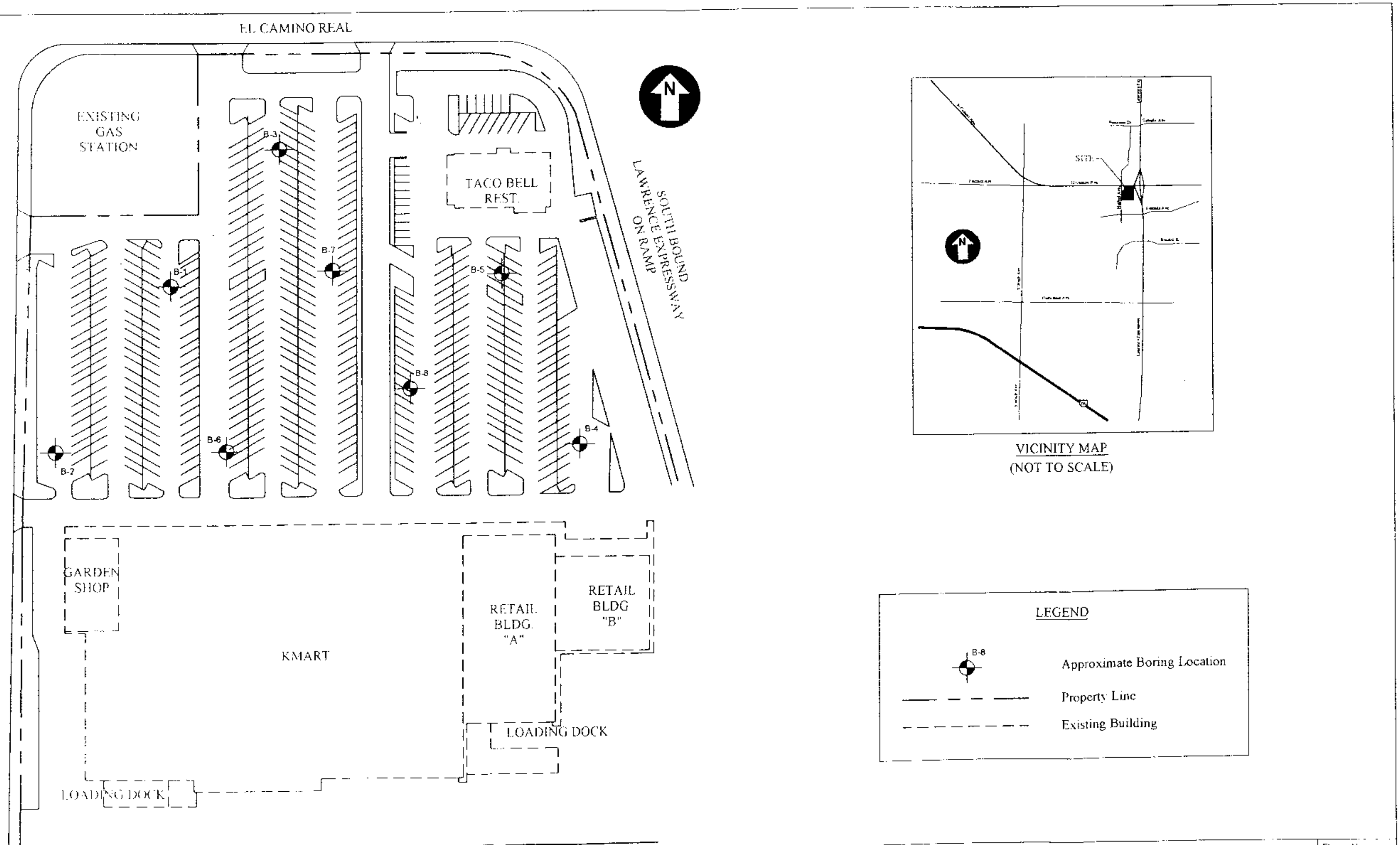
FIELD INVESTIGATION

The field investigation was performed on September 15, 2003, and included a reconnaissance of the site and the drilling of 8 exploratory borings at the approximate locations shown on Figure 2, "Site Plan."

The borings were drilled to a maximum depth of 50 feet below the existing ground surface. The explorations were then advanced to 50 feet using continuous sampling. The drilling was performed with a Mobile B3500 truck mounted drilling equipment using power-driven, 6-inch diameter, continuous flight augers. Visual classifications were made from auger cuttings and the samples in the field. As the drilling proceeded, relatively undisturbed core samples were obtained by means of a 2.5 inch O.D. Modified California split-tube sampler containing 2 inch O.D. brass liners. The sampler was advanced into the soils at various depths under the impact of a 140-pound hammer having a free fall of 30 inches. The number of blows required to advance the sampler 12 inches into the soil, after seating the sampler 6 inches, were adjusted to the standard penetration resistance (N-Value).

The samples were sealed and returned to our laboratory for testing. Classifications made in the field were verified in the laboratory after further examination and testing.

The stratification of the soils, descriptions, location of undisturbed soil samples and standard penetration resistance are shown on the respective "Logs of Test Borings" contained within this appendix.



GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

257 WRIGHT BROTHERS AVENUE, LIVERMORE CALIFORNIA 94550. PHONE: (925) 243-6662

SITE PLAN

MS. EMILY CHEN
CORNER OF
HALFORD AVE. & EL CAMINO REAL
SANTA CLARA, CALIFORNIA

Project No	Drawn by	Figure No
9993.G	E.PACREM	1
Scale	**Date**	
1" = 100'	10/2003	

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-1
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0		Dark brown silty CLAY, moist, very stiff to hard.	CL-CH					
	1A			31	105.9	18.3		PI=28
	1B			28	114.4	15.9		UNC=13636
		Brown to light brown silty CLAY to clayey SILT, moist, medium dense to very stiff.	CL-ML					
10	1C			28	115.3	13.5		
		Brown to light brown silty fine SAND to sandy SILT, moist, dense to hard.	SM-ML					
	1D			33	106.9	17.8		Ø=28 deg, c=510 psf
		Brown to dark brown silty fine to medium SAND, some fine gravel, slightly moist, dense.	SM					
20	1E	some fine gravel, slightly moist.		50 (6")	117.4	4.2		
30	1F	less gravel, moist, medium dense.		17	96.2	15.7		

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	2

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-1
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
40	1G			increase in gravel content, dense to very dense.		50 (5")	134.9	7.6		
50				Boring terminaiton depth at 50 feet below original ground elevation. Groundwater encountered at 23 feet below original grade.						
60										
70										

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	2

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-2
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0				Dark brown silty CLAY, moist, very stiff.	CL-CH					
	2A					20	101.2	20.9		
	2B					16	102.4	20.5		
				Brown to light brown silty CLAY to clayey SILT, moist, dense to hard.	CL-ML					
10	2C					35	112.8	16.5		
	2D					51	111.5	16.7		
				Some fine to medium gravels.						
20	2E			very stiff to medium dense. 6-inch thick fine sandy layer.		21	108.9	16.9		
				Boring Terminaiton Depth at 21.5 feet below ori.inal ground elevation. No groundwater encountered.						
30										

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	3

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-3
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0				Dark brown silty CLAY, moist, very stif.	CL-CH					
				Brown to light brown silty CLAY, moist, very stiff.	CL					UNC=7688 ps
	3A					22	115.3	13.5		
10										
				increase in moisture content.						
	3B					13	109.9	22.0		c=700 psi, Ø=20 deg.
				trace fine sand, very moist.						
20										
				silty sandy CLAY, trace fine gravels. hard, moist.						
	3C					48	124.4	13.1		
				Dark brown silty fine to coarse SAND, slightly moist to moist, dense to very dense.	SW-SM					
	3D					50	143.5	6.8		
30				Boring Terminaiton Depth at 29.5 feet below original ground elevation. Groundwater encountered at 22.5 feet at completion of drilling.						

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	4

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-4
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0				Dark brown silty CLAY, moist, hard to very hard.	CL-CH					
	4A					41	108.3	16.6		
10				Brown to light brown sandy silty CLAY, moist, very stiff to hard.	CL-ML					
	4B					44	113.5	13.1		
20				trace fine gravels.						
	4C			very stiff.		20	110.9	18.2		
				Boring Terminaiton Depth. No groundwater encountered.						
30										

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	5

LOGGED BY JAJ	SURFACE ELEVATION NA -feet		BORING NO. B-5
DRILL RIG B-3500	BORING DIAMETER 6" -inch		DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0				Dark brown silty CLAY, moist, hard to very hard.	CL-CH					
	5A					48	115.4	14.5		
10	5B			hard		35	115.4	13.6		
				Brown to light brown fine sandy silty CLAY, moist, very stiff.	CL-ML					
				Dark brown silty fine to coarse SAND, some fine gravels, slightly moist, very dense.	SW-SM					
20	5C					60	121.2	4.0		
				Boring termination depth at 25 feet below original ground elevation. No groundwater encountered.						
30										

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	6

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-6
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0		Dark brown silty CLAY, moist, very stiff.	CL-CH					
	6A			25	99.8	17.2		
		less moisture						
10								
		Brown to light brown fine to coarse sandy silty CLAY, slightly moist to moist, very stiff.	CL-ML					
	6B			50(6")	115.4	13.6		
		Dark brown silty fine to coarse SAND, some fine gravels, slightly moist, very dense.	SW-SM					
20								
		Brown to light brown silty CLAY, some fine to coarse sand, moist, hard.	CL-ML					
	6C			51	102.3	18.2		
		occasionally dense sandy lenses						
		Brown clayey SAND to fine to coarse sandy silty CLAY, moist, very dense to hard.	VC					
30								
	6D			50(6")				
		Boring termintion depth at 36.5 feet below						

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	7

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-6
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
40				original ground level. Groundwater encountered 21 feet below originl ground level.						
50										
60										
70										

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	7

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-7
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0				Dark brown silty CLAY, moist, very stiff.	CL-CH					
	7A					29	101.4	21.1		
10				Brown to light brown fine to coarse sandy silty CLAY, slightly moist to moist, very stiff.	CL					
	7B					40	112.3	21.2		c=950 psf Ø=30 deg.
				Dark brown silty fine to coarse SAND, some fine to coarse gravels, slightly moist, very dense.	SW-SM					
20	7C					50(6")	133.1	4.4		
				increase in coarse gravel content.						
30										
				Boring Terminaiton Depth at 36.5 feet below						

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1160

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	8

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-7
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
				original ground elevation. Groundwater encountered at 23 feet below original ground level.						
40										
50										
60										
70										

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676. (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	8

LOGGED BY JAJ	SURFACE ELEVATION NA -feet	BORING NO. B-8
DRILL RIG B-3500	BORING DIAMETER 6" -inch	DATE DRILLED 9/15/03

DEPTH (feet)	SAMPLE NO.	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (PERCENT)	PERCENT RELATIVE COMPACTION	ADDITIONAL TESTS
0		Dark brown silty CLAY, moist, very stiff.	CL-CH					
	8A			29	98.0	22.6		
		Brown to light brown silty CLAY, moist, very stiff.	CL					
10								
		Dark Brown gravelly silty SAND, slightly moist, medium dense.	SW-SM					
	8B			33	125.4	4.6		
20								
		Brown to light brown clayey fine to coarse SAND moist, dense.	SC					
	8C	hard, moist.		37	112.9	18.5		
		Boring termination depth at 26.5 feet below origial ground elevation. No groundwater encountered.						
30								

GEOTECHNICAL ENGINEERS AND GEOLOGISTS

TERRASEARCH INC.

1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676 (408) 453-1180

EXPLORATORY BORING LOG

Santa Clara Square

Santa Clara, Ca

PROJECT NO.	DATE	FIGURE
9993.G	10/17/2003	9

KEY TO SYMBOLS

Symbol Description

Strata symbols

Low-high plasticity clays

Silty low plasticity clay

Poorly graded silty fine sand

Silty sand

Low plasticity clay

Well graded sand with silt

Silty sandy clay

Clayey sand

Misc. Symbols

Water table at boring completion

Water table during drilling

Soil Samplers

Standard penetration test

Notes:

1. Exploratory borings were drilled on using a 4-inch diameter continuous flight power auger.
2. No free water was encountered at the time of drilling or when re-checked the following day.
3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

APPENDIX B

Laboratory Investigation

Summary of Laboratory Test Results

LABORATORY INVESTIGATION

The laboratory testing program was directed towards providing sufficient information for the determination of the engineering characteristics of the site soils so that the recommendations outlined in this report could be formulated.

Moisture content and dry density tests (ASTM D2937-83) were performed on representative relatively undisturbed soil samples in order to determine the consistency of the soil and the moisture variation throughout the explored soil profile as well as estimate the compressibility of the underlying soils.

The strength parameters of the foundation soils were determined from direct shear and unconfined compression tests performed on a selected relatively undisturbed soil sample.

Field penetration resistance (N) assisted in the determination of the strength parameters of the soils. The standard penetration resistance's are recorded on the respective "Logs of Test Borings."

The expansion characteristics of the near-surface soils were evaluated by means of Atterberg Limits tests performed in accordance with ASTM D4318.

A summary of all laboratory test results is presented on TABLE I of this appendix and on the respective "Logs of Test Borings", Appendix A.

TABLE I

Summary of Laboratory Test Results

				Atterberg Limits			Direct Shear	
Sample No.	Depth (ft.)	Dry Density (p.c.f.)	Moisture Content (% Dry Wt.)	Liquid Limit (%)	Plasticity Index	Unconfined Compression Test (p.s.f.)	Cohesion (c) (p.s.f.)	Friction (ø) °
1A	2.0	105.9	18.3	47	28			
1B	5.0	114.4	15.9			13636		
1C	10.0	115.3	13.5					
1D	15.0	106.9	17.8				510	28
1E	20.0	117.4	4.2					
1F	30.0	96.2	15.7					
1G	40.0	134.9	7.6					
2A	2.0	101.2	20.9					
2B	5.0	102.4	20.5					
2C	10.0	112.8	16.5					
2D	15.0	111.5	16.7					
2E	20.0	108.1	16.9					
3A	8.0	115.3	13.5			7688		
3B	18.0	109.9	22.0				700	20
3C	23.0	124.4	13.1					
3D	28.0	143.5	6.8					
4A	5.0	108.3	16.6					
4B	15.0	113.5	13.1					
4C	25.0	110.9	18.2					
5A	5.0	115.4	14.5					
5B	10.0	115.4	13.6					

5C	20.0	121.2	4.0					
6A	5.0	99.8	17.2					
6B	15.0	132.9	3.7					
6C	25.0	102.3	18.2					
7A	2.0	101.4	21.1	51	31			
7B	10.0	112.3	21.2				950	30
7C	20.0	133.1	4.4					
8A	5.0	98.0	22.6					
8B	15.0	125.4	4.6					
8C	25.0	112.9	18.5					

APPENDIX C

The Grading Specifications

Guide Specifications For Rock Under Floor Slabs

THE GRADING SPECIFICATIONS

on

Santa Clara Square

Santa Clara, California

1. General Description

1.1 These specifications have been prepared for the grading and site development of the subject project. *TERRASEARCH, Inc.*, hereinafter described as the Soil Engineer, should be consulted prior to any site work connected with site development to ensure compliance with these specifications.

1.2 The Soil Engineer should be notified at least two working days prior to any site clearing or grading operations on the property in order to observe the stripping of organically contaminated material and to coordinate the work with the grading contractor in the field.

1.3 This item shall consist of all clearing or grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans. The Soil Engineer is not responsible for determining line, grade elevations, or slope gradients. The property owner, or his representative, shall designate the person or organizations that will be responsible for these items of work.

1.4 The contents of these specifications shall be integrated with the soil report of which they are a part, therefore, they shall not be used as a self-contained document.

2. Tests

The standard test used to define maximum densities of all compaction work shall be the ASTM D1557-91 Laboratory Test Procedure. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

3. Clearing, Grubbing, and Preparing Areas To Be Filled

3.1 All vegetable matter, trees, root systems, shrubs, debris, and organic topsoil shall be removed from all structural areas and areas to receive fill.

3.2 Any soil deemed soft or unsuitable by the Soil Engineer shall be removed. Any existing debris or excessively wet soils shall be excavated and removed as required by the Soil Engineer during grading.

3.3 All underground structures shall be removed from the site such as old foundations, abandoned pipe lines, septic tanks, and leach fields.

3.4 The final stripped excavation shall be approved by the Soil Engineer during construction and before further grading is started.

3.5 After the site has been cleared, stripped, excavated to the surface designated to receive fill, and scarified, it shall be disked or bladed until it is uniform and free from large clods. The native subgrade soils shall be moisture conditioned and compacted to the requirements as specified in the grading section of this report. Fill can then be placed to provide the desired finished grades. The contractor shall obtain the Soil Engineer's approval of subgrade compaction before any fill is placed.

4. Materials

4.1 All fill material shall be approved by the Soil Engineer. The material shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension and not more than 15% larger than 2-1/2 inches. Materials from the site below the stripping depth are suitable for use in fills provided the above requirements are met.

4.2 Materials existing on the site are suitable for use as compacted engineered fill after the removal of all debris and organic material. All fill soils shall be approved by the Soil Engineer in the field.

4.3 Should import material be required, it must meet the requirements as specified in the body of this report prior to transporting it to the project.

5. Placing, Spreading, and Compacting Fill Material

5.1 The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either (a) aerating the material if it is too wet, or (b) spraying the material with water if it is too dry.

5.2 After each layer has been placed, mixed, and spread evenly, either import material or native material shall be compacted to a relative compaction of 90% at a moisture content 3% above optimum as determined by ASTM D1557-91 Laboratory Test Procedure.

5.3 Compaction shall be by footed rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting shall be permitted.

5.4 Field density tests shall be performed by the Soil Engineer in accordance with Laboratory Test Procedure ASTM D2922-91 and D3017-88. When footed rollers are used for compaction, the density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the compaction requirement on any layer of fill, or portion thereof, has not been met, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

5.5 No soil shall be placed or compacted during periods of rain or on ground which contains free water. Soil which has been soaked and wetted by rain or any other cause shall not be compacted until completely drained and until the moisture content is within the limits hereinbefore described or approved by the Soil Engineer. Approval by the Soil Engineer shall be obtained prior to continuing the grading operations.

6. Pavement

6.1 The proposed subgrade under pavement sections, native soil, and/or fill shall be compacted to a minimum relative compaction of 95% at a moisture content slightly above optimum for a depth of 6 inches.

6.2 All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-91. The construction of the pavement in the parking and traffic areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or City of Santa Clara, Department of Public Works.

6.3 It is recommended that soils at the proposed subgrade level be tested for a pavement design after the preliminary grading is completed and the soils at the site design subgrade levels are known.

7. Utility Trench Backfill

7.1 The utility trenches extending under concrete slabs-on-grade shall be backfilled with native on-site soils or approved import materials and compacted to the requirements pertaining to the adjacent soil. No ponding or jetting will be permitted.

7.2 Utility trenches extending under all pavement areas shall be backfilled with native or approved import material and properly compacted to meet the requirements set forth by the City of Santa Clara, Department of Public Works.*

*NOTE: Requirements of City to be added.

7.3 Where any opening is made under or through the perimeter foundations for such items as utility lines and trenches, the openings must be resealed so that they are watertight to prevent the possible entrance of outside irrigation or rain water into the underneath portion of the structures.

8. Subsurface Line Removal

8.1 The methods of removal will be designated by the Soil Engineer in the field depending on the depth and location of the line. One of the following methods will be used.

8.2 Remove the pipe and fill and compact the soil in the trench according to the applicable portions of sections pertaining to compaction and utility backfill.

8.3 The pipe shall be crushed in the trench. The trench shall then be filled and compacted according to the applicable portions of Section 5.

8.4 Cap the ends of the line with concrete to prevent entrance of water. The length of the cap shall not be less than 5 feet. The concrete mix shall have a minimum shrinkage.

9. Unusual Conditions

In the event that any unusual conditions not covered by the special provisions are encountered during the grading operations, the Soil Engineer shall be immediately notified for additional recommendations.

GUIDE SPECIFICATIONS FOR ROCK UNDER FLOOR SLABS

Definition

Graded gravel or crushed rock for use under slabs-on-grade shall consist of a minimum thickness of mineral aggregate placed in accordance with these specifications and in conformance with the dimensions shown on the plans. The minimum thickness is specified in the accompanying report.

Material

The mineral aggregate shall consist of broken stone, crushed or uncrushed gravel, quarry waste, or a combination thereof. The aggregate shall be free from deleterious substances. It shall be of such quality that the absorption of water in a saturated dry condition does not exceed 3% of the oven dry weight of the sample.

Gradation

The mineral aggregate shall be of such size that the percentage composition by dry weight, as determined by laboratory sieves (U.S. Sieves) will conform to the following gradation:

Sieve Size	Percentage Passing
¾"	90-100
No. 4	25-40
No. 8	18-33
No. 200	0-3

Placing

Subgrade, upon which gravel or crushed rock is to be placed, shall be prepared as outlined in the accompanying soil report.

Environmental • Geotechnical • Special Inspections • Materials Testing

TERRASEARCH INC.

SERVING NORTHERN CALIFORNIA SINCE 1969

Project No. 9993.G
December 4, 2003

GEOTECHNICAL

GEOLOGICAL

ENVIRONMENTAL

SPECIAL INSPECTIONS

MATERIALS TESTING

SAN JOSE:
6840 Via Del Oro
Suite 110
San Jose, CA 95119
(408) 362-4920
Fax: (408) 362-4926

LIVERMORE:
257 Wright Brothers Ave.
Livermore, CA 94551
(925) 243-6662
Fax: (925) 243-6663

SACRAMENTO:
4200 N. Freeway Blvd.
Suite 2
Sacramento, CA 95834
(916) 564-7809
Fax: (916) 564-7672

Ms. Emily Chen
21009 Seven Springs Parkway
Cupertino, CA 95014

SUBJECT: Proposed Development
Santa Clara Square
Halford Avenue
Santa Clara, California
Response to Comment Letter

References. 1) Geotechnical Investigation Report Project No. 9993.G
Santa Clara Square
Halford Avenue
By Terrasearch, Inc., Dated October 6, 2003

2) Geotechnical Report Review Letter
Santa Clara Square
By Mindigo & Associates, Dated October 28, 2003

Dear Ms. Emily Chen:

We have reviewed the comments contained in the letter from Mindigo & Associates, dated October 28, 2003 in regards to the report contained in reference item 1. Following is our response to those comments:

1. Page 5, Second Paragraph shall be amended to read:

   a. The rectangular shaped, relatively flat site is approximately 12 acres and is currently used for parking. A portion of the site in the southwestern corner of El Camino Real and Lawrence Expressway is occupied by a Taco Bell Restaurant which is to be removed. An existing gas station is located at the southwestern corner of El Camino Real and Halford Avenue, which is to remain. An existing Kmart building which is located to the immediate south of the subject property is to *be removed.*

2. Page 5, Third Paragraph shall be amended to read:

   a. The site is bounded to the north by El Camino Real, to the east by the Lawrence Expressway, to the west by Halford Avenue and to the south by *a single family attached residential development.* The location of the site is shown on the *Site Plan, Vicinity Map*, Figure 1 of Appendix A. This description of the site is based on a reconnaissance by the Soil Engineer, and a tentative site plan. The site plan is the basis for our "Site Plan," *Figure 1* of Appendix A.

3. A site is defined as being located in a Seismic Hazard Zone based on regional maps created by the California Geological Survey. The maps were created as a requirement of the Seismic Hazards Mapping Act of 1990.

4. The typographical errors on the Title Page, transmittal letter, and pages 4 and 5 have been corrected as outlined in reference item 2.

Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,
TERRASEARCH, Inc.

Johan Jacobsen, P.E.
Project Engineer